Lynx Sound Overview: This document is an overview for those who have had trouble seeing the forest for the trees. You should also read page 29 of the handy hardware spec. and the handy audio hardware overview starting on page 35 of the Handy software programmer's guide and notes. And of course handy appendix 2 hardware addresses FD20 through FD50.

1. What in the world were we thinking when we designed the sound hardware?

The original design goals were that the circuits:
1. be cheap
2. require relatively little cpu help to make useful game noises
3. have sufficient range and accuracy for tolerable music
4. have 4 channels
5. have direct access to the DACs.
6. be cheap.

Our approach was similar to the Atari 800 or 2600 sound system.

First we gave it 4 polynomial counters. What are they?

The Lynx system clock is 16 Megahertz, a bit high for music on this planet. So we pass the clock through some dividers to knock it down. First are some binary prescalers, then into the dreaded poly counter. The poly counter is really just a programmable divider. A binary counter (the normal kind) would divide by 7 by counting 0,1,2,3,4,5,6,0,1,2,3,4,5,6 etc. A polynomial counter might count 0,2,5,4,3,1,6,0,2,5,4,3,1,6 etc. It has the same number of states but they come in a pseudo-random order. The repeat period is programmed by selecting the initial value in the shift register (set shifter) and by picking which feedback taps are connected.

Why poly? Don't you like binary?

Binary is fine if you like square waves. Suppose you want a motor sound for a race game. A square wave tone is clearly not sufficient. A poly with a fairly quick repeat period will introduce a slight garble to the pure tone making a better engine sound. Once started the sound continues by itself with no additional CPU work. To increase the motor's RPM, keep the same shifter set-up and just change the frequency it's clocked with (the prescaler). More on this below. Thus with minimum CPU work we can make a complex engine sound that changes RPM smoothly.

Next we gave the CPU direct access to the four 8 bit DACs. A running poly counter uses a DAC for its output, but we wanted to give the programmer the flexibility to write to unused channels directly. There has been some confusion about the DACs since they are used with the poly system to sort of make 127 loudness levels. The truth is they can be used as 4 independent true 8 bit DACs.

Finally there is a one pole RC filter in hardware on the output at about 4500 Hz. Future stereo versions anticipate a bass boost circuit.